

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,976,052 B2

Page 1 of 12

APPLICATION NO. : 09/761264

DATED : December 13, 2005

INVENTOR(S) : Michael E. Tompkins et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, drawing should be deleted to appear as per the attached Fig. 1.

The sheets of drawings consisting of figures 1-13 should be deleted as per attached figures 1-13.

Page 3, OTHER PUBLICATIONS,

delete "Photograph of an ACC SC-200 circuit board." and insert --Photograph of an ACC SC-200 circuit board--;

delete "Siege's Supplemental memorandum of law on the Construction of Claims 1 and 37" and insert --Siege's Supplemental Memorandum of Law on the Construction of Claims 1 and 37--.

Column 1,

Line 62, delete "away from the sap" and insert --away from the spa--.

Column 2,

Line 12, delete "start" and insert --start--.

Column 5,

Line 1, delete "the signals" and insert --the low signals--.

Line 14, delete "6f" and insert --of--.

Column 6,

Line 67, after "base" delete "be".

Column 7,

Line 40, delete "4Q" and insert --40--.

Column 8,

Line 28, delete "fo" and insert --of--.

Line 43, delete "the turn" and insert --then turn--.

Line 52, delete "TEMPERTURE" and insert --TEMPERATURE--.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 9,

Line 3, delete “(pH input” and insert --(pH input)–.  
Line 35, delete “CALn.” and insert --CALn--.  
Line 55, delete “setting” and insert --setting--.  
Line 66, delete “Ln:xx” and insert --Hn:xx--.

Column 10,

Line 18, delete “th” and insert --the--.  
Line 21, delete “use” and insert --user--.  
Line 34, delete “Hn:Er” and insert --PH:Er--.  
Line 37, delete “he” and insert --the--.  
Line 41, delete “marches” and insert --matches--.  
Line 53, delete “if a” and insert --if the--.

Column 11,

Line 47, delete “is maintenance mode” and insert --is in maintenance mode--.  
Line 53, delete “re” and insert --are--.

Column 12,

Line 9, delete “fog” and insert --from--.  
Line 42, delete “a on/off” and insert --an on/off--.  
Line 43, delete “hey” and insert --they--.

Column 13,

Line 18, delete “or” and insert --for--.  
Line 22, delete “dressed” and insert --pressed--.

Column 16,

Line 4, delete “Present” and insert --present--.

Column 17,

Line 12, delete “trough” and insert --through--.  
Line 13, delete “lag” and insert --flag--.  
Line 43, delete “Th&up” and insert --The up--.

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INVENTOR(S) : Michael E. Tompkins et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 19,

Line 19, delete "are" and insert --the--.

Line 41, delete "or" and insert --for--.

Line 52, delete "here" and insert --there--.

Line 55, delete "heaving" and insert --heating--.

Line 64, delete "ox" and insert --of--.

Column 20,

Line 2, delete "scheduler" and insert --scheduled--.

Line 7, delete "educe" and insert --reduce--.

Line 38, delete "sa" and insert --spa--.

Line 38, after "unattended" insert --. (a period).

Column 21,

Line 26, delete "convening" and insert --converting--.

Column 22,

Line 7, delete "Interconnection" and insert --interconnection--.

Signed and Sealed this

Fifteenth Day of January, 2008



JON W. DUDAS  
*Director of the United States Patent and Trademark Office*

(12) United States Patent  
Tompkins et al.(10) Patent No.: US 6,976,052 B2  
(45) Date of Patent: Dec. 13, 2005

## (54) SPA CONTROL SYSTEM

(75) Inventors: Michael E. Tompkins, Houston, TX  
(US); Michael J. Green, Houston, TX  
(US)(73) Assignee: Balboa Instruments, Inc., Tustin, CA  
(US)(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 373 days.

(21) Appl. No.: 09/761,264

(22) Filed: Jan. 16, 2001

## (65) Prior Publication Data

US 2001/0029407 A1 Oct. 11, 2001

## Related U.S. Application Data

(63) Continuation of application No. 08/822,179, filed on Mar.  
20, 1997, now Pat. No. 6,253,227, which is a continuation of  
application No. 08/703,177, filed on Aug. 23, 1996, now  
abandoned, which is a continuation of application No.  
08/327,927, filed on Oct. 24, 1994, now Pat. No. 5,559,720,  
which is a continuation of application No. 08/225,282, filed  
on Jan. 11, 1994, now Pat. No. 5,361,215, which is a  
continuation of application No. 07/224,869, filed on Jul. 26,  
1998, now abandoned, which is a continuation-in-part of  
application No. 07/054,581, filed on May 27, 1997, now  
abandoned.

(51) Int. Cl. 7 ..... G06F 13/00

(52) U.S. Cl. ..... 709/201; 4/493; 210/169

(58) Field of Search ..... 210/169; 709/201;  
392/465, 466, 485, 498; 219/497, 481,  
489; 4/538, 539, 540, 541.1, 541.2, 493

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pretty splashy," San Diego Union Tribune, May 9, 1986.

(Continued)

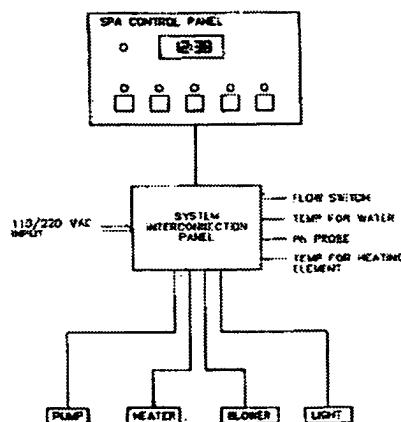
Primary Examiner—Moustafa M. Meky

(74) Attorney, Agent, or Firm—Pulwider Patton Lee &  
Utechi LLP

## (57) ABSTRACT

An improved spa control system is disclosed. The invention describes a spa control system which calculates the time required to heat the water in the spa system to a desired temperature. From that information, the heating rate of the spa system can be determined, and the heating element of the spa system can be activated at the proper time to raise the temperature of the water to a selected temperature by a desired time. The spa system also monitors information which might show errors in the operation of the spa system such as a blockage in the flow of water over the heating element in the spa system.

24 Claims, 8 Drawing Sheets



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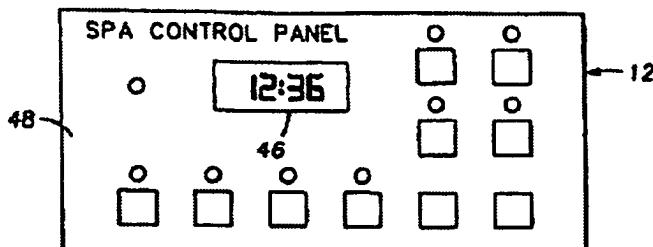


FIG. 1

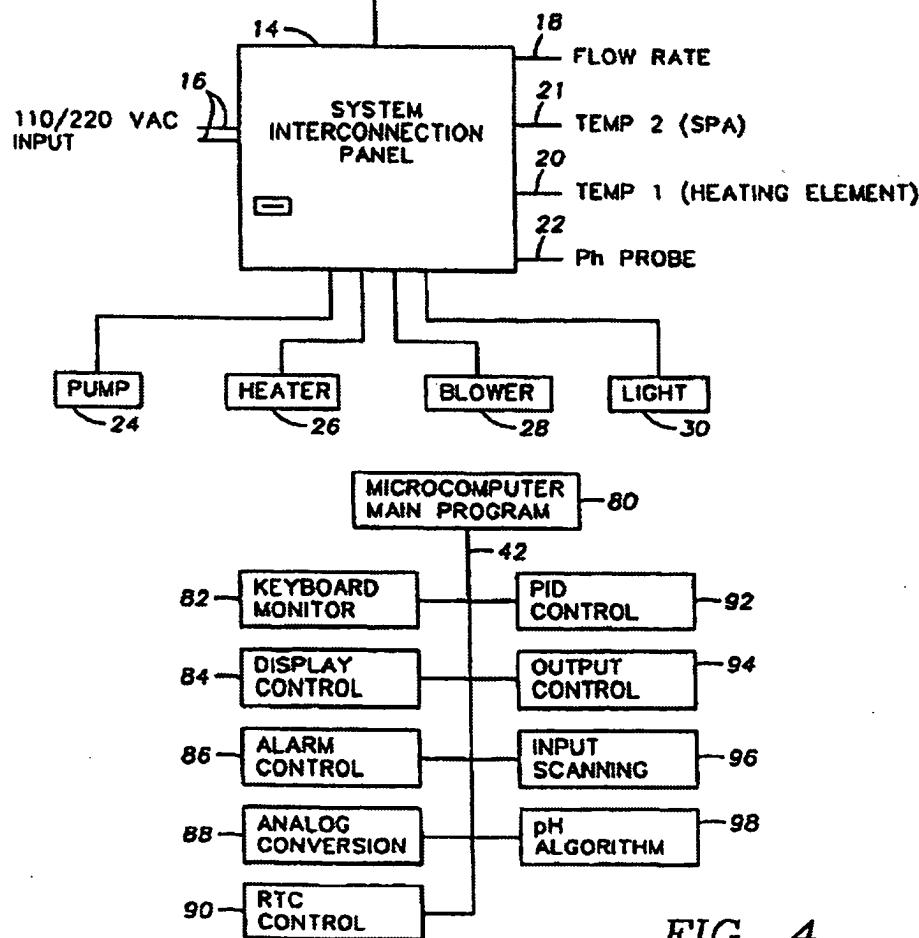


FIG. 4

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FIG. 2

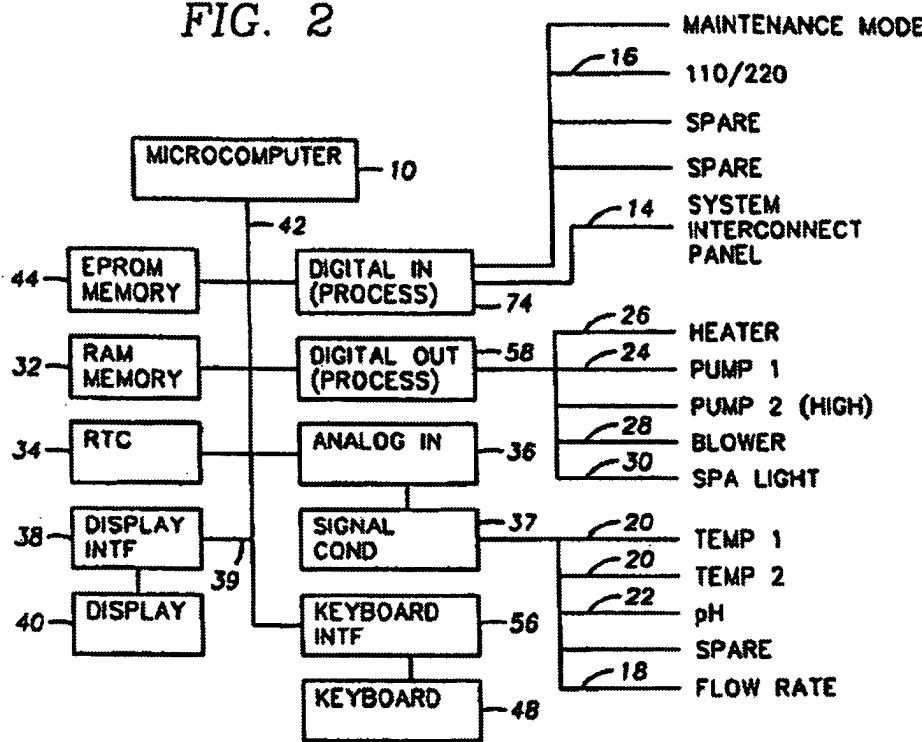
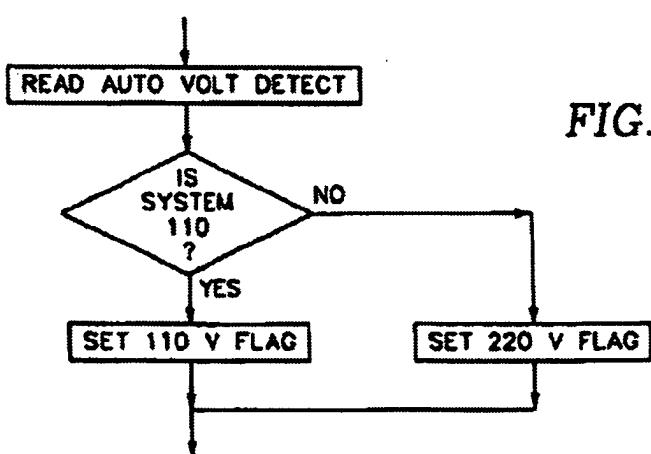


FIG. 8



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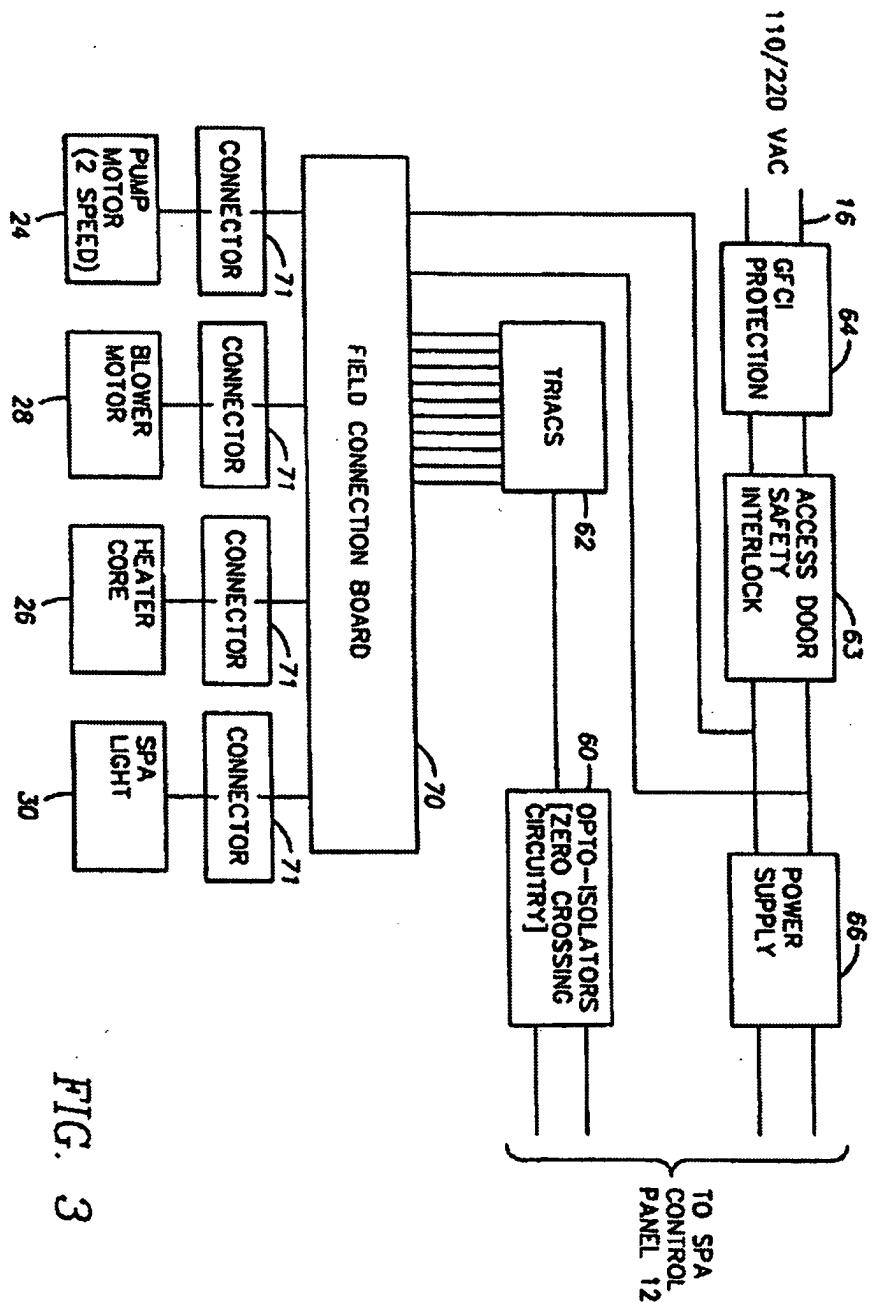


FIG. 3

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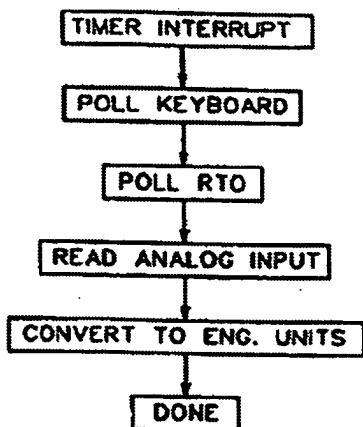


FIG. 12

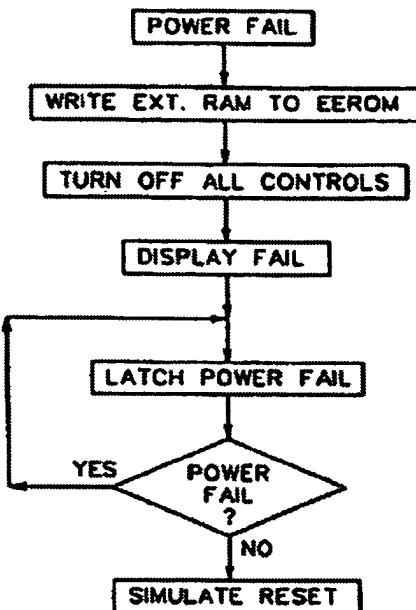


FIG. 13

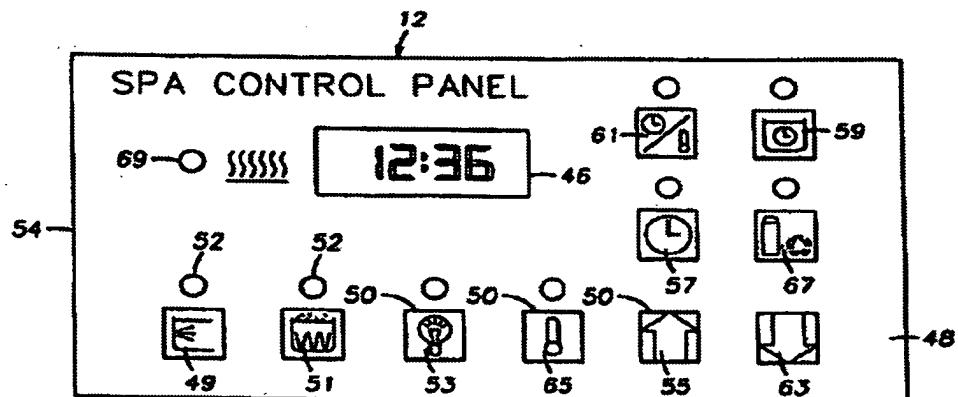


FIG. 5

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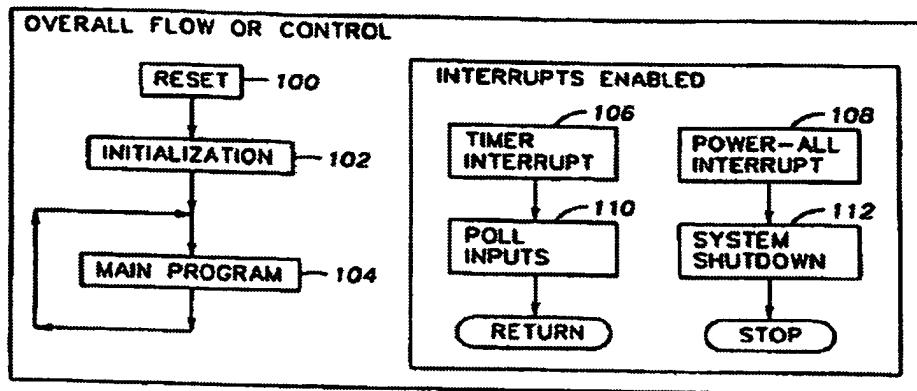


FIG. 6

$TEMP_F$  = DESIRED TEMPERATURE OF SPA WATER  
 $TEMP_1$  = TEMPERATURE AT FIRST SENSOR ( $S_1$ )  
 $TEMP_2$  = TEMPERATURE AT SECOND SENSOR ( $S_2$ )  
 $TEMP_\Delta$  =  $TEMP_1 - TEMP_2$   
 $\Delta L$  = LIMIT OF ACCEPTABLE TEMPERATURE DIFFERENCE (+ OR -)

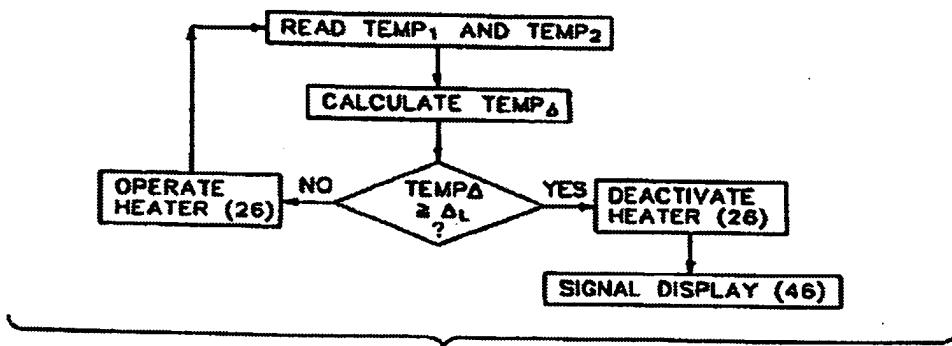


FIG. 7

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RATE = RATE OF HEATING  
RATEAV = RATE OF HEATING (AVERAGE)  
TEMP<sub>I</sub> = INITIAL TEMPERATURE OF SPA WATER  
TEMP<sub>F</sub> = DESIRED TEMPERATURE OF SPA WATER  
TEMP<sub>A</sub> = TEMP<sub>F</sub> - TEMP<sub>I</sub>  
TIME<sub>I</sub> = TIME (INITIAL)  
TIME<sub>F</sub> = TIME (FINAL)  
TIME<sub>A</sub> = TIME<sub>F</sub> - TIME<sub>I</sub>

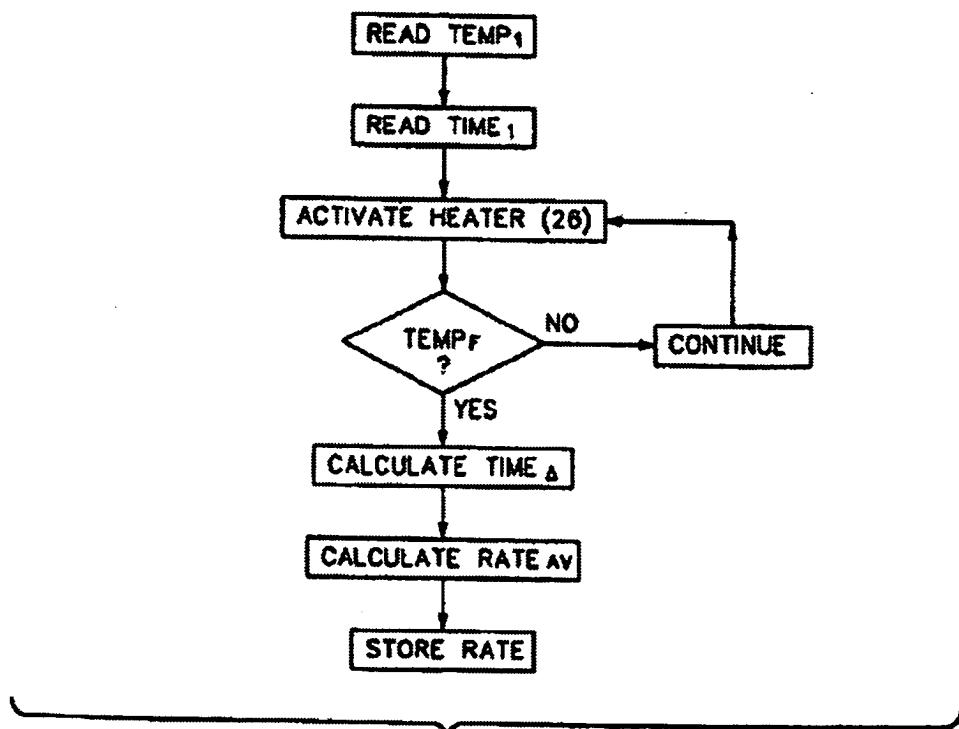


FIG. 9

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$\text{TEMP}_I$  = INITIAL TEMPERATURE OF SPA WATER  
 $\text{TEMP}_F$  = FINAL (DESIRED) TEMPERATURE OF SPA WATER  
 $\text{TEMP}_\Delta$  =  $\text{TEMP}_F - \text{TEMP}_I$   
 $\text{RATE}$  = RATE OF HEATING  
 $\text{RATE AV}$  = RATE OF HEATING (AVERAGE)  
 $\text{TIME}_I$  = TIME (INITIAL)  
 $\text{TIME}_F$  = TIME (FINAL)  
 $\text{TIME}_\Delta$  =  $\text{TIME}_F - \text{TIME}_I$

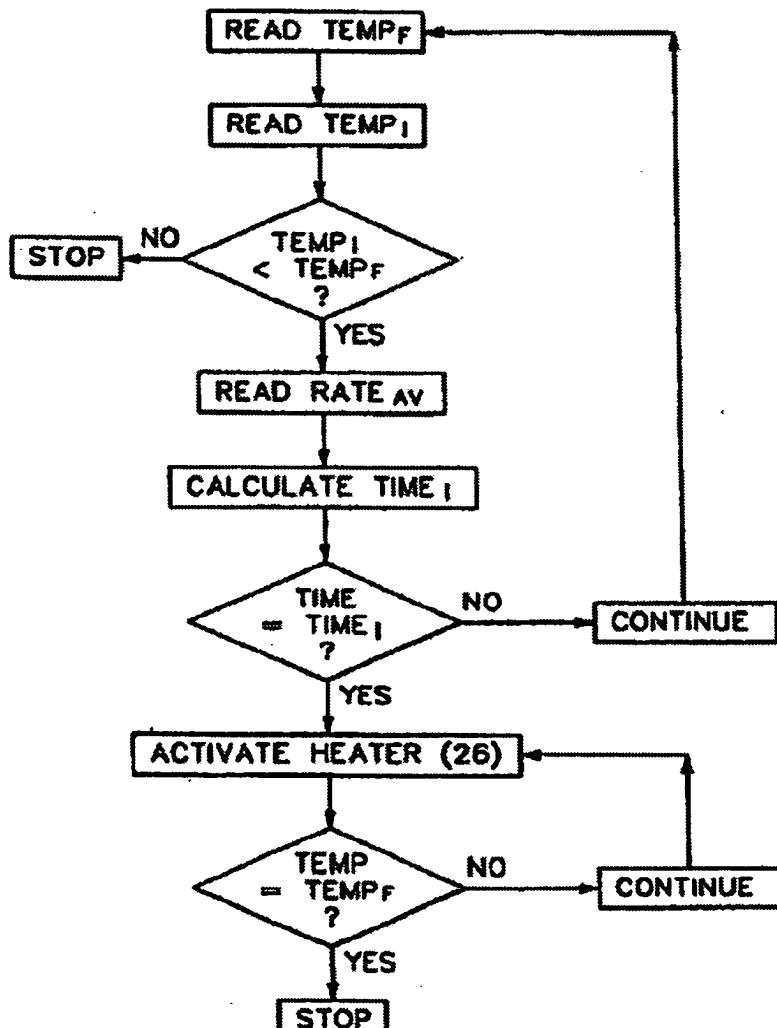


FIG. 10

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